



Managing Linux Kernel Configs

With Config Fragments

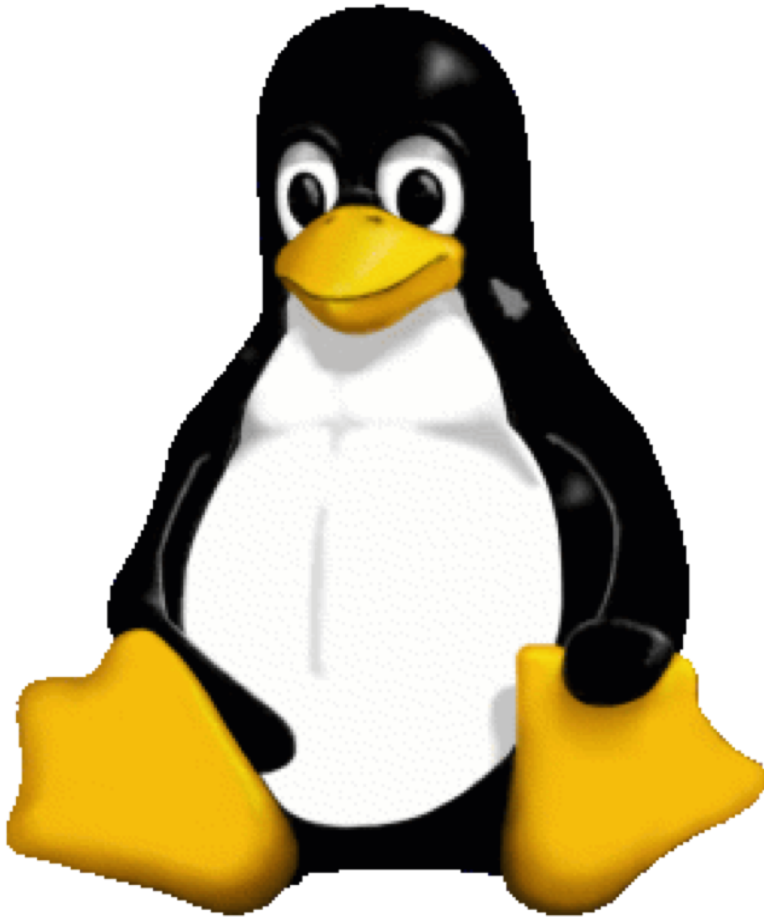
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Linux Platform Driver x86 Maintainer

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Linux Kernel Configurations



```
~/source/linux/linux-stable-config
3446 # CONFIG_VFIO is not set
3447 # CONFIG_VIRT_DRIVERS is not set
3448 CONFIG_VIRTIO_MENU=y
3449 # CONFIG_VIRTIO_PCI is not set
3450 # CONFIG_VIRTIO_MMIO is not set
3451
3452 #
3453 # Microsoft Hyper-V guest support
3454 #
3455 # CONFIG_STAGING is not set
3456 CONFIG_X86_PLATFORM_DEVICES=y
3457 CONFIG_ACER_WMI=m
3458 CONFIG_ACER_WIRELESS=m
3459 CONFIG_ACERHDF=m
3460 CONFIG_ALIENWARE_WMI=m
3461 CONFIG_ASUS_LAPTOP=m
3462 CONFIG_DELL_SMBIOS=m
3463 CONFIG_DELL_SMBIOS_WMI=y
3464 CONFIG_DELL_LAPTOP=m
3465 CONFIG_DELL_WMI=m
3466 CONFIG_DELL_WMI_DESCRIPTOR=m
3467 CONFIG_DELL_WMI_AIO=m
3468 CONFIG_DELL_WMI_LED=m
3469 CONFIG_DELL_SM08800=m
3470 CONFIG_DELL_RBTN=m
3471 CONFIG_FUJITSU_LAPTOP=m
3472 CONFIG_FUJITSU_TABLET=m
3473 CONFIG_AMILO_RFKILL=m
3474 CONFIG_GPD_POCKET_FAN=m
3475 CONFIG_HP_ACCEL=m
3476 CONFIG_HP_WIRELESS=m
3477 CONFIG_HP_WMI=m
3478 CONFIG_MSI_LAPTOP=m
3479 CONFIG_PANASONIC_LAPTOP=m
```

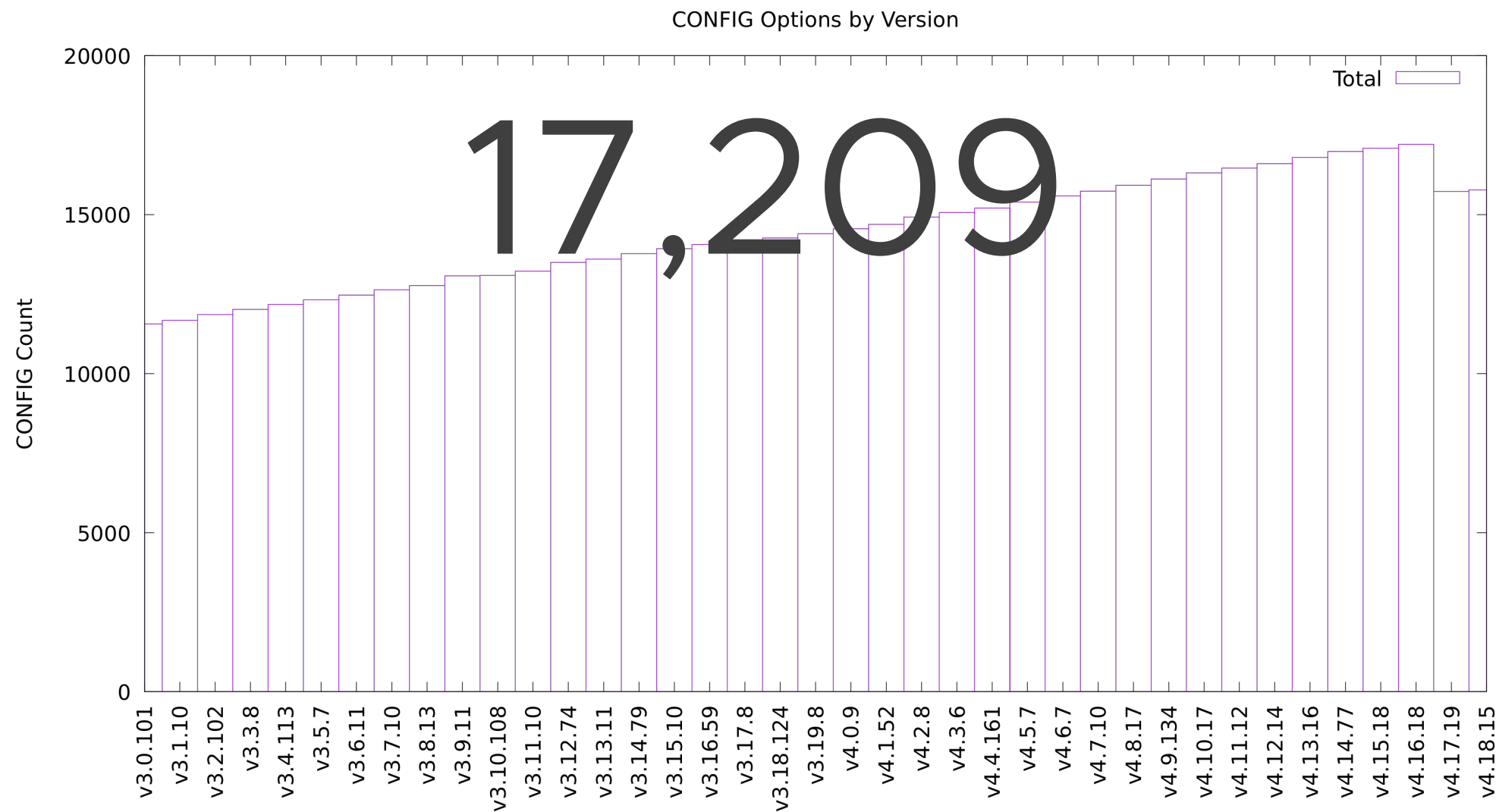
3456,29 78%

CONFIG Count

17,209

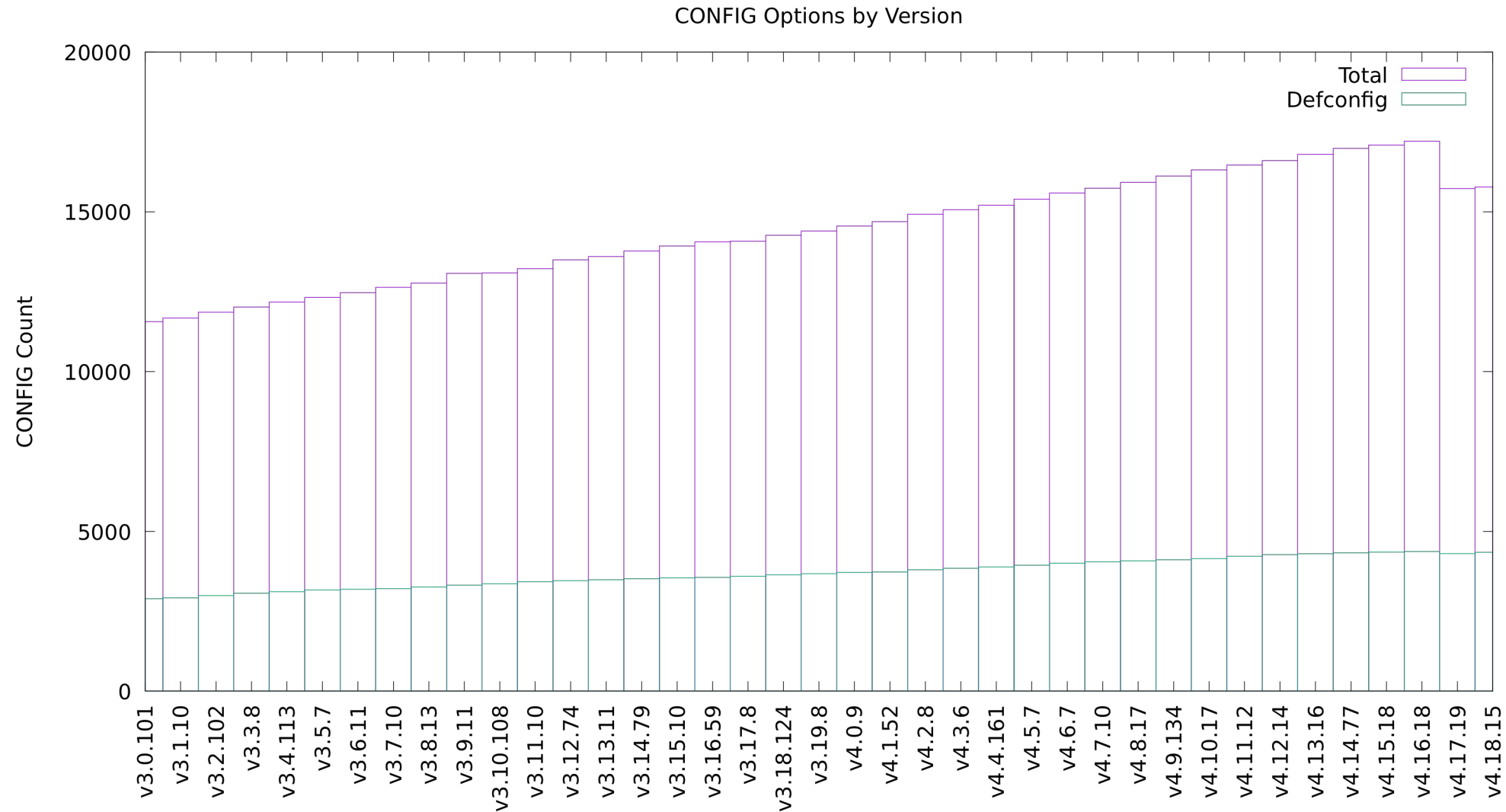
CONFIG Count

3.0 to 4.18



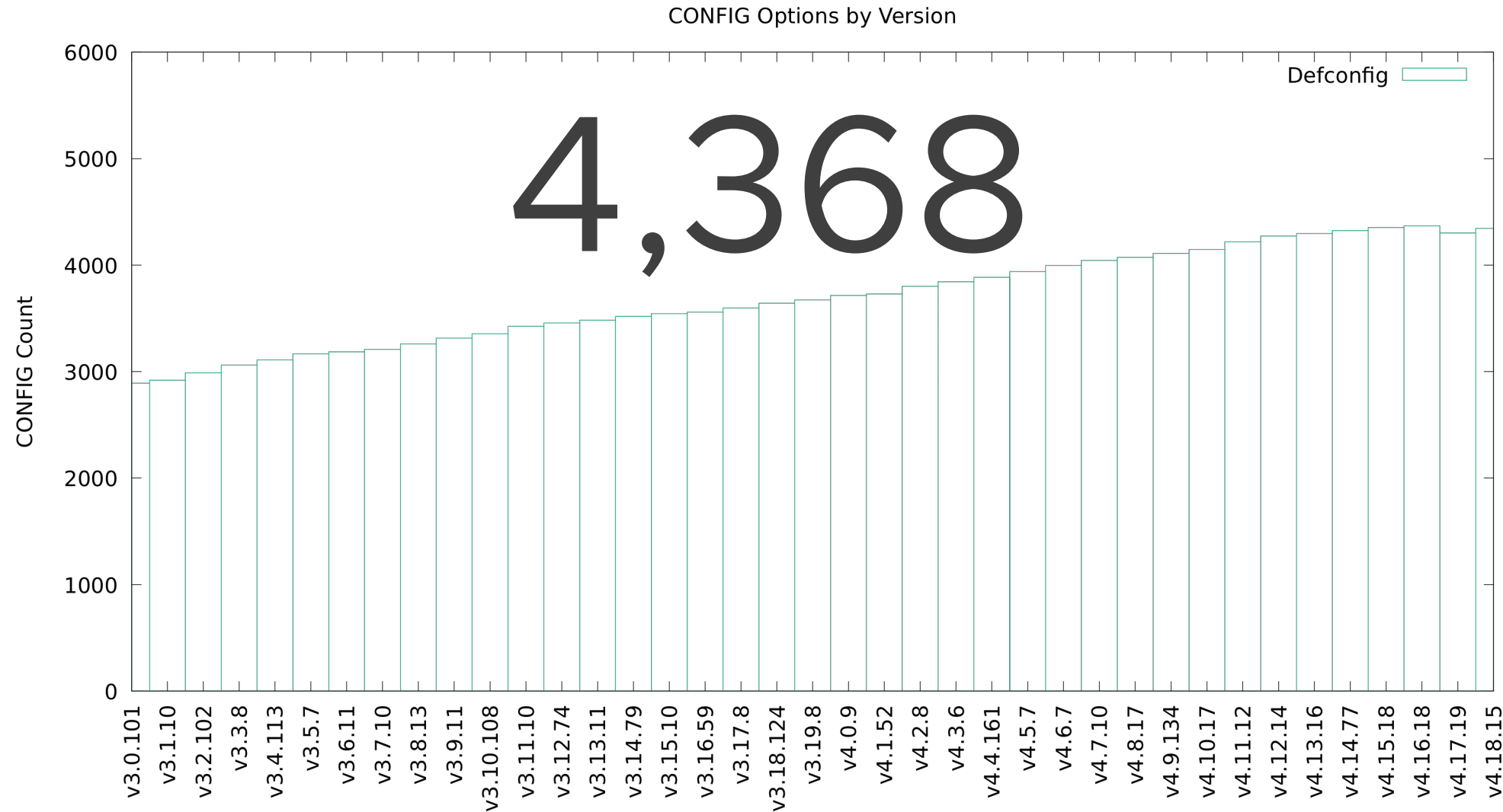
CONFIG Count

3.0 to 4.18



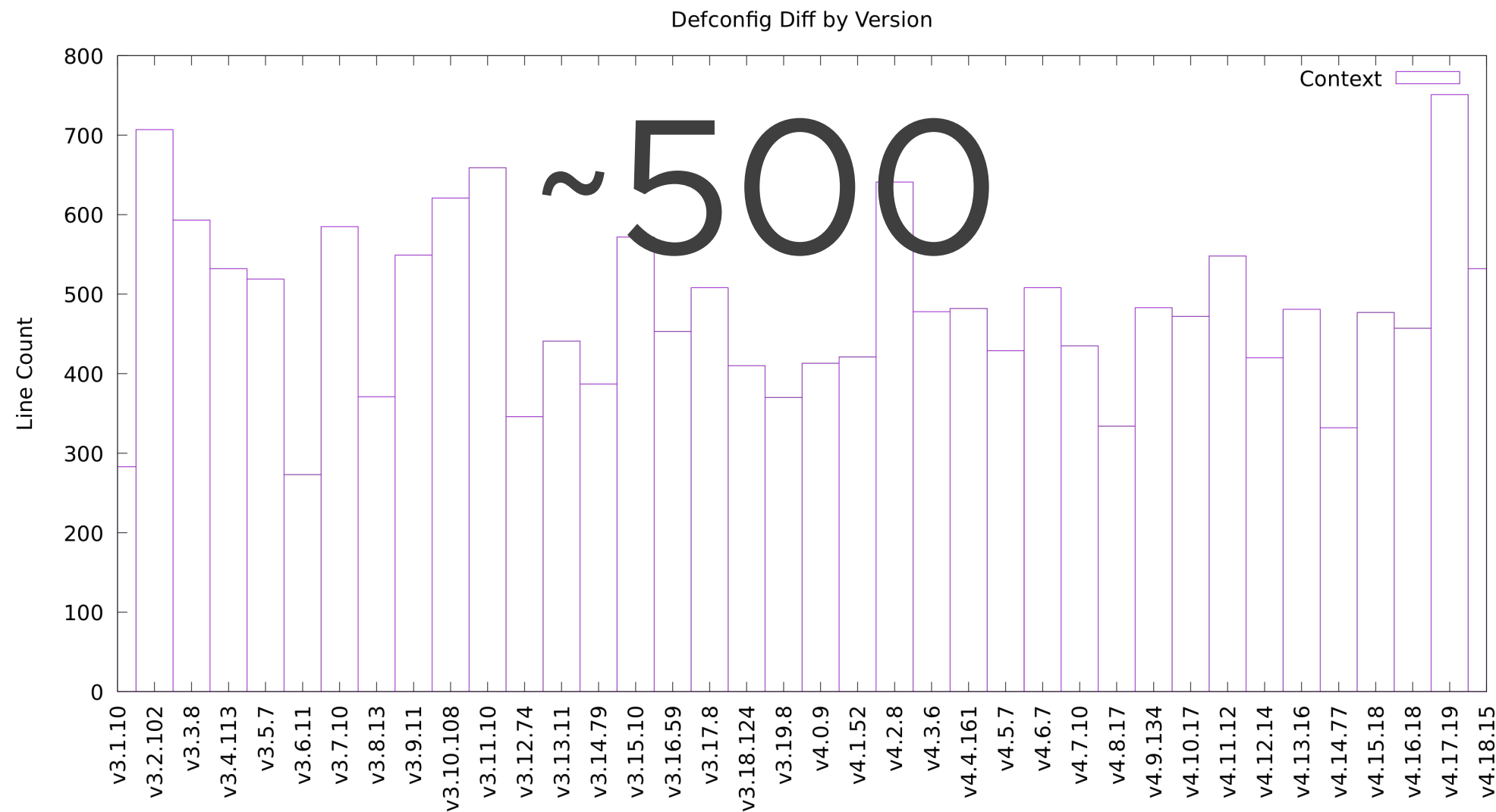
Defconfig CONFIG Count

3.0 to 4.18



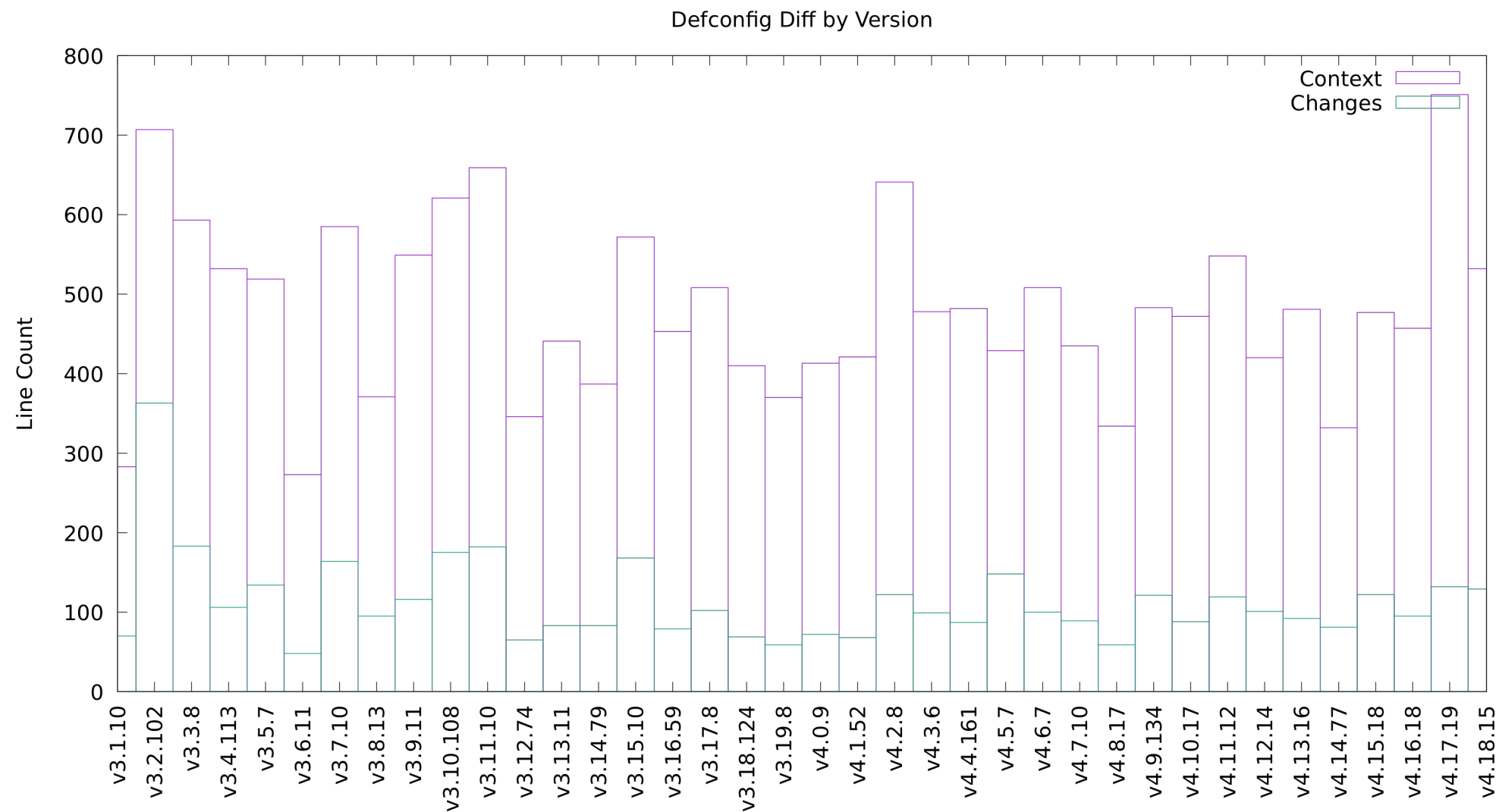
Defconfig Diff

3.0 to 4.18



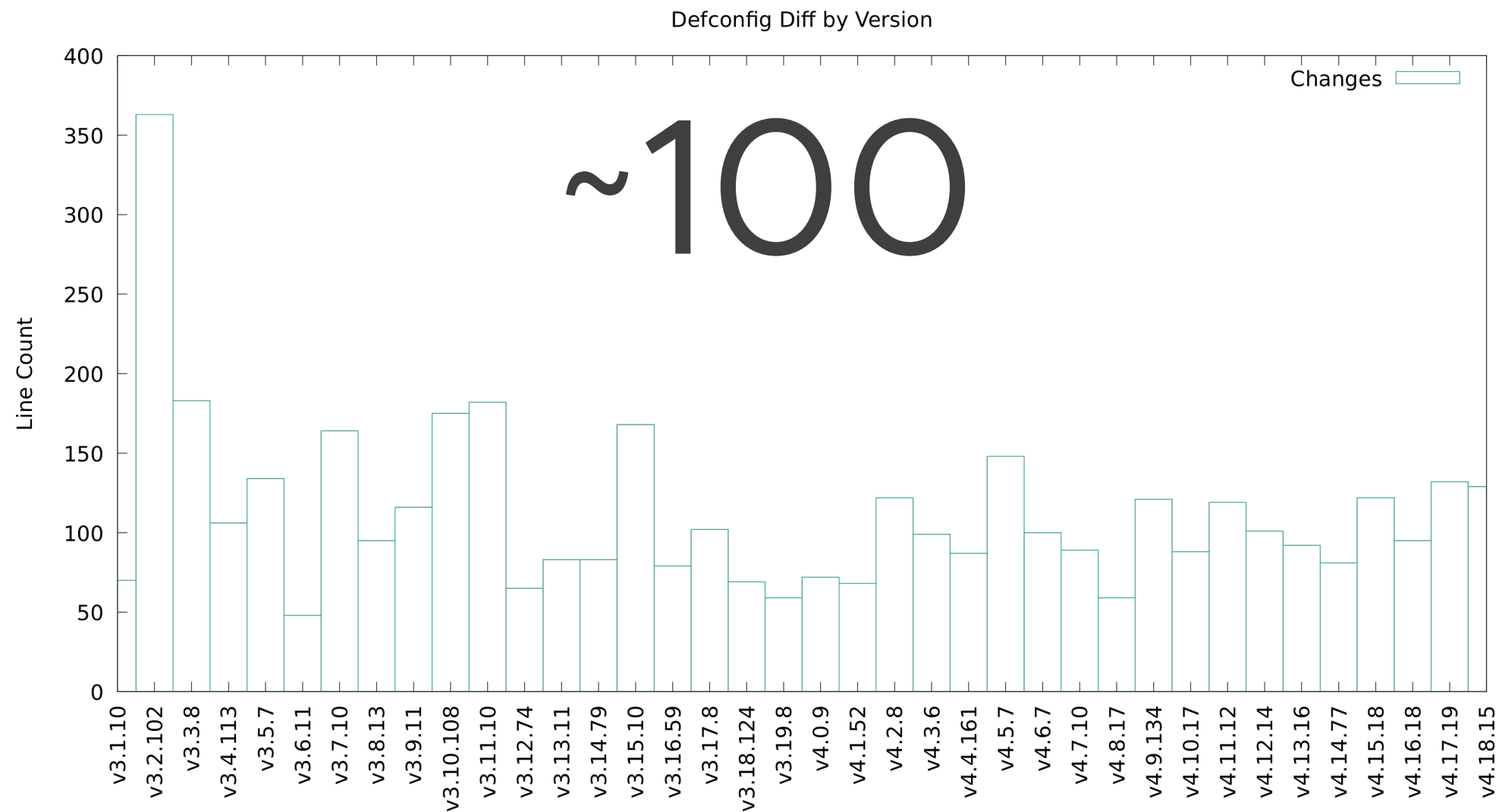
Defconfig Diff

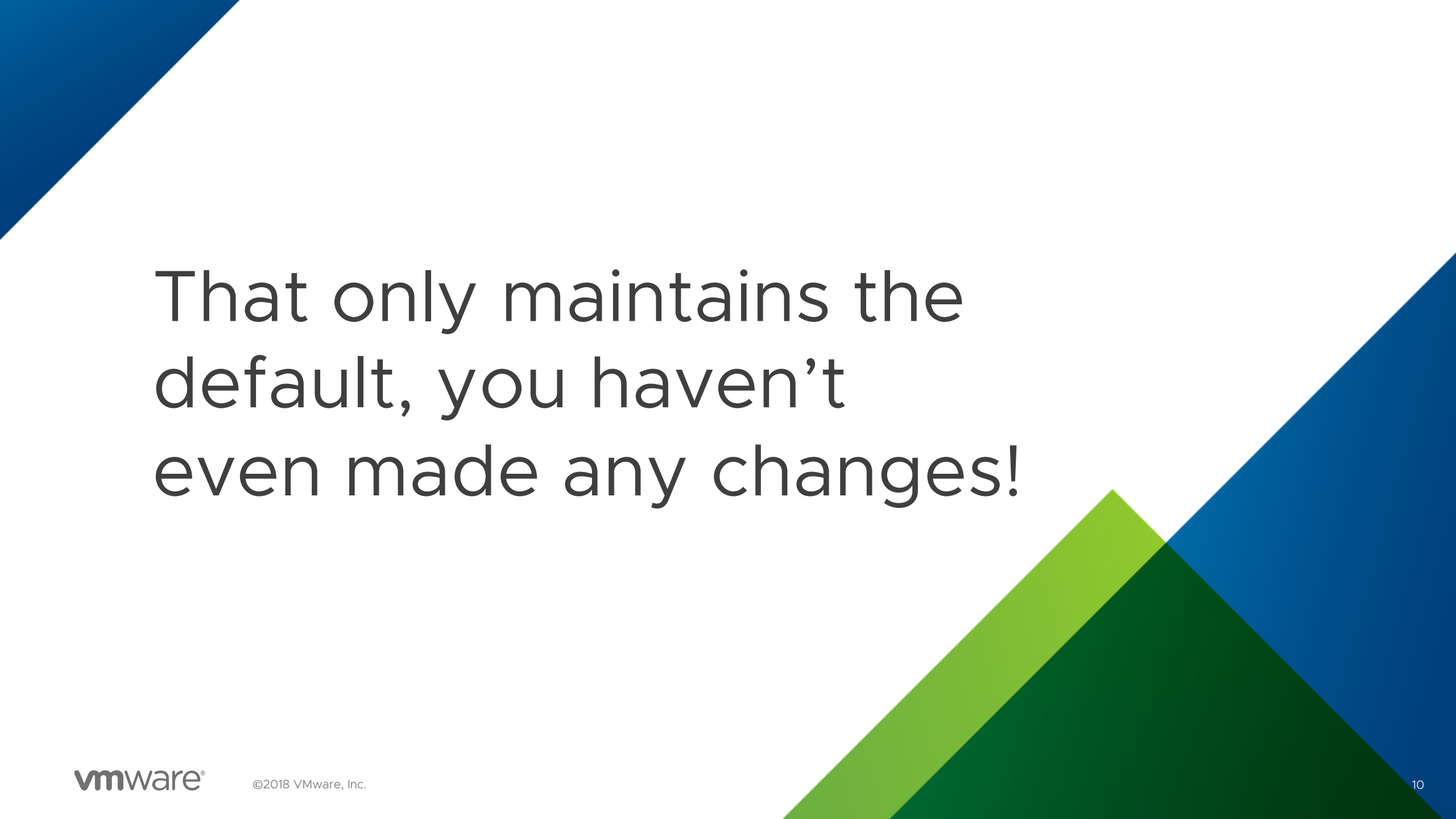
3.0 to 4.18



Defconfig Diff

3.0 to 4.18





That only maintains the
default, you haven't
even made any changes!

Kconfig Language Overview

type: bool | tristate | string | hex | int

prompt: user visible description [if <expr>]

default: y | m | n

depends: on SYMBOL [if <expr>]

select: SYMBOL [if <expr>]

For excruciating detail, see [Documentation/kbuild/kconfig-language.txt](https://www.kernel.org/doc/Documentation/kbuild/kconfig-language.txt)

```
~/source/linux/linux-stable-config
107
108 #
109 # The DELL_SMBIOS driver depends on ACPI_WMI and/or DCDBAS if those
110 # backends are selected. The "depends" line prevents a configuration
111 # where DELL_SMBIOS=y while either of those dependencies =m.
112 #
113 config DELL_SMBIOS
114 |----- tristate "Dell SMBIOS driver"
115 |----- depends on DCDBAS || DCDBAS=n
116 |----- depends on ACPI_WMI || ACPI_WMI=n
117 |----- ---help---
118 |----- This provides support for the Dell SMBIOS calling interface.
119 |----- If you have a Dell computer you should enable this option.
120
121 |----- Be sure to select at least one backend for it to work properly.
122
123 config DELL_SMBIOS_WMI
124 |----- bool "Dell SMBIOS driver WMI backend"
125 |----- default y
126 |----- depends on ACPI_WMI
127 |----- select DELL_WMI_DESCRIPTOR
128 |----- depends on DELL_SMBIOS
129 |----- ---help---
130 |----- This provides an implementation for the Dell SMBIOS calling interface
131 |----- communicated over ACPI-WMI.
132
133 |----- If you have a Dell computer from >2007 you should say Y here.
134 |----- If you aren't sure and this module doesn't work for your computer
135 |----- it just won't load.
136
137 config DELL_SMBIOS_SMM
138 |----- bool "Dell SMBIOS driver SMM backend"
139 |----- default y
```

125,2-9 8%

CONFIG Revision Control

A Good Commit Contains...

1. Problem **description**
2. Developer **intent**
3. **Changes** address the problem and match intent
4. **Nothing else**

Enable DELL SMBIOS Driver

CONFIG_ACPI_WMI

CONFIG_DELL_SMBIOS

```
~/source/linux/linux-stable-config
.config - Linux/x86 4.18.15 Kernel Configuration
> Device Drivers > X86 Platform Specific Device Drivers
    X86 Platform Specific Device Drivers
    Arrow keys navigate the menu. <Enter> selects submenus ---> (or empty
    submenus ----). Highlighted letters are hotkeys. Pressing <Y>
    includes, <N> excludes, <M> modularizes features. Press <Esc><Esc> to
    exit, <?> for Help, </> for Search. Legend: [*] built-in [ ]

    --- X86 Platform Specific Device Drivers
    < >  Acer WMI Laptop Extras
    < >  Acer Wireless Radio Control Driver
    < >  Acer Aspire One temperature and fan driver
    < >  Alienware Special feature control
    < >  Asus Laptop Extras
    <M>  Dell SMBIOS driver
    [*]  Dell SMBIOS driver WMI backend
    < >  Dell Laptop Extras
    < >  Dell WMI notifications
    < >  WMI Hotkeys for Dell All-In-One series
    < >  External LED on Dell Business Netbooks
    < >  Dell Latitude freefall driver (ACPI SM088XX)
    < >  Dell Airplane Mode Switch driver
    < >  Fujitsu Laptop Extras
    < >  Fujitsu Tablet Extras
    ↑(+)
```

<Select> <Exit> <Help> <Save> <Load>

CONFIG Diff

Enable DELL_SMBIOS_WMI

```
--- config-data.qZ4A/v4.18.15-defconfig.config      @@ -3394,6 +3402,7 @@
    2018-10-18 18:49:14.829616612 -0700 CONFIG_X86_PLATFORM_DEVICES=y
+++ .config 2018-10-20 21:47:33.442444208 -          # CONFIG_GPD_POCKET_FAN is not set
0700          # CONFIG_HP_ACCEL is not set
@@ -3382,10 +3382,18 @@          # CONFIG_HP_WIRELESS is not set
CONFIG_VIRTIO_MENU=y          +# CONFIG_HP_WMI is not set
#          # CONFIG_MSI_LAPTOP is not set
# CONFIG_STAGING is not set          # CONFIG_PANASONIC_LAPTOP is not set
CONFIG_X86_PLATFORM_DEVICES=y          # CONFIG_COMPAL_LAPTOP is not set
+# CONFIG_ACER_WMI is not set          @@ -3403,11 +3412,17 @@
# CONFIG_ACER_WIRELESS is not set          CONFIG_X86_PLATFORM_DEVICES=y
# CONFIG_ACERHDF is not set          # CONFIG_SENSORS_HDAPS is not set
+# CONFIG_ALIENWARE_WMI is not set          # CONFIG_INTEL_MENLOW is not set
# CONFIG_ASUS_LAPTOP is not set          CONFIG_EEPC_LAPTOP=y
-# CONFIG_DELL_SMBIOS is not set          +# CONFIG_ASUS_WMI is not set
+CONFIG_DELL_SMBIOS=m          # CONFIG_ASUS_WIRELESS is not set
+CONFIG_DELL_SMBIOS_WMI=y          -# CONFIG_ACPI_WMI is not set
+# CONFIG_DELL_LAPTOP is not set          +CONFIG_ACPI_WMI=m
+# CONFIG_DELL_WMI is not set          +CONFIG_WMI_BMOF=m
+CONFIG_DELL_WMI_DESCRIPTOR=m          +# CONFIG_INTEL_WMI_THUNDERBOLT is not
+# CONFIG_DELL_WMI_AIO is not set          set
+# CONFIG_DELL_WMI_LED is not set          +# CONFIG_MSI_WMI is not set
# CONFIG_DELL_SMO8800 is not set          +# CONFIG_PEAQ_WMI is not set
# CONFIG_DELL_RBTN is not set          # CONFIG_TOPSTAR_LAPTOP is not set
# CONFIG_FUJITSU_LAPTOP is not set          # CONFIG_TOSHIBA_BT_RFKILL is not set

# CONFIG_TOSHIBA_HAPS is not set
+# CONFIG_TOSHIBA_WMI is not set
# CONFIG_ACPI_CMPC is not set
# CONFIG_INTEL_HID_EVENT is not set
# CONFIG_INTEL_VBTN is not set
@@ -3415,6 +3430,7 @@
CONFIG_EEPC_LAPTOP=y
# CONFIG_INTEL_PMC_CORE is not set
# CONFIG_IBM_RTL is not set
# CONFIG_SAMSUNG_LAPTOP is not set
+# CONFIG_MXM_WMI is not set
# CONFIG_INTEL_OAKTRAIL is not set
# CONFIG_SAMSUNG_Q10 is not set
# CONFIG_APPLE_GMUX is not set
```

57 Line Diff

CONFIG Diff

Enable DELL_SMBIOS_WMI

```
--- config-data.qZ4A/v4.18.15-defconfig.config
    2018-10-18 18:49:14.829616612 -0700
+++ .config 2018-10-20 21:47:33.442444208 -
0700
@@ -3382,10 +3382,18 @@
CONFIG_VIRTIO_MENU=y
#
# CONFIG_STAGING is not set
CONFIG_X86_PLATFORM_DEVICES=y
+# CONFIG_ACER_WMI is not set
# CONFIG_ACER_WIRELESS is not set
# CONFIG_ACERHDF is not set
+# CONFIG_ALIENWARE_WMI is not set
# CONFIG_ASUS_LAPTOP is not set
-# CONFIG_DELL_SMBIOS is not set
+CONFIG_DELL_SMBIOS=m
+CONFIG_DELL_SMBIOS_WMI=y
+# CONFIG_DELL_LAPTOP is not set
+# CONFIG_DELL_WMI is not set
+CONFIG_DELL_WMI_DESCRIPTOR=m
+# CONFIG_DELL_WMI_AIO is not set
+# CONFIG_DELL_WMI_LED is not set
# CONFIG_DELL_SMO8800 is not set
# CONFIG_DELL_RBTN is not set
# CONFIG_FUJITSU_LAPTOP is not set
```

```
@@ -3394,6 +3402,7 @@
CONFIG_X86_PLATFORM_DEVICES=y
# CONFIG_GPD_POCKET_FAN is not set
# CONFIG_HP_ACCEL is not set
# CONFIG_HP_WIRELESS is not set
+# CONFIG_HP_WMI is not set
# CONFIG_MSI_LAPTOP is not set
# CONFIG_PANASONIC_LAPTOP is not set
# CONFIG_COMPAL_LAPTOP is not set
@@ -3403,11 +3412,17 @@
CONFIG_X86_PLATFORM_DEVICES=y
# CONFIG_SENSORS_HDAPS is not set
# CONFIG_INTEL_MENLOW is not set
CONFIG_EEPC_LAPTOP=y
+# CONFIG_ASUS_WMI is not set
# CONFIG_ASUS_WIRELESS is not set
-# CONFIG_ACPI_WMI is not set
+CONFIG_ACPI_WMI=m
+CONFIG_WMI_BMOF=m
+# CONFIG_INTEL_WMI_THUNDERBOLT is not
set
+# CONFIG_MSI_WMI is not set
+# CONFIG_PEAQ_WMI is not set
# CONFIG_TOPSTAR_LAPTOP is not set
# CONFIG_TOSHIBA_BT_RFKILL is not set
```

```
# CONFIG_TOSHIBA_HAPS is not set
+# CONFIG_TOSHIBA_WMI is not set
# CONFIG_ACPI_CMPC is not set
# CONFIG_INTEL_HID_EVENT is not set
# CONFIG_INTEL_VBTN is not set
@@ -3415,6 +3430,7 @@
CONFIG_EEPC_LAPTOP=y
# CONFIG_INTEL_PMC_CORE is not set
# CONFIG_IBM_RTL is not set
# CONFIG_SAMSUNG_LAPTOP is not set
+# CONFIG_MXM_WMI is not set
# CONFIG_INTEL_OAKTRAIL is not set
# CONFIG_SAMSUNG_Q10 is not set
# CONFIG_APPLE_GMUX is not set
```

57 Line Diff

CONFIG Fragment

Enable DELL_SMBIOS_WMI

dell-smbios-wmi.config -> arch/x86/configs/

CONFIG_ACPI_WMI=m

CONFIG_DELL_SMBIOS=m

CONFIG_DELL_SMBIOS_WMI=y

```
~/source/linux/linux-stable-config
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ make defconfig &>/dev/null
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ grep DELL_SMBIOS .config
# CONFIG_DELL_SMBIOS is not set
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ make defconfig dell-smbios-wmi.config &>/dev/null
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ grep DELL_SMBIOS .config
CONFIG_DELL_SMBIOS=m
CONFIG_DELL_SMBIOS_WMI=y
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$
```


CONFIG Fragment Processing

```
Activities Terminal Sat 22:37 ~/source/linux/linux-stable-config
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ make defconfig dell-smbios-wmi.config | grep -ve "^"
*** Default configuration is based on 'x86_64_defconfig'
#
# configuration written to .config
#
Using .config as base
Merging ./arch/x86/configs/dell-smbios-wmi.config
Value of CONFIG_ACPI_WMI is redefined by fragment ./arch/x86/configs/dell-smbios-wmi.config:
Previous value: # CONFIG_ACPI_WMI is not set
New value: CONFIG_ACPI_WMI=m

Value of CONFIG_DELL_SMBIOS is redefined by fragment ./arch/x86/configs/dell-smbios-wmi.config:
Previous value: # CONFIG_DELL_SMBIOS is not set
New value: CONFIG_DELL_SMBIOS=m

#
# merged configuration written to .config (needs make)
#
scripts/kconfig/conf --oldconfig Kconfig
*
* Restart config...
*
*
* X86 Platform Specific Device Drivers
*
X86 Platform Specific Device Drivers (X86_PLATFORM_DEVICES) [Y/n/?] y
#
# configuration written to .config
#
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$
```

merge_config.sh

```
~/source/linux/linux-stable-config x
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$ scripts/kconfig/merge_config.sh -h
Usage: scripts/kconfig/merge_config.sh [OPTIONS] [CONFIG [...]]
  -h      display this help text
  -m      only merge the fragments, do not execute the make command
  -n      use allnoconfig instead of alldefconfig
  -r      list redundant entries when merging fragments
  -O      dir to put generated output files. Consider setting $KCONFIG_CONFIG instead.
dvhart@fedora:~/source/linux/linux-stable-config [(v4.18.15)]
$
```

CONFIG Fragment Organization

- Distro policy
- Machine architecture
- Platform enabling
- Generic drivers

Looking Forward...

- Menuconfig could generate fragments
- Avoid silent errors
- Final config audit



Thank You

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